

## Original communication

## Pediatric and adolescent strangulation deaths

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**Abstract**

The incidence of pediatric and adolescent deaths due to unnatural means is increasing. Fatal strangulation constitutes a significant group of violent deaths. The characteristics of pediatric and adolescent involvement has been rarely studied. In the present study, a cohort of 28 cases of pediatric and adolescent strangulation deaths was analyzed. The data for the study were collected from inquest papers, post-mortem reports and other departmental records for the period 1993–2004 (12 years). Female victims were more than male with male, female ratio of 3:4. Ligature strangulation was three times more frequent than manual strangulation. Ninety three percent were homicidal and the remaining 7% accidental. Fracture of neck structures was found in 25% of the cases and other associated injuries on different body parts were observed in more than half of the cases. Clothing and personal belongings were the most common ligature materials and in the majority of cases the exact reason for strangulation was not known at the time of postmortem.

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**Keywords:** Pediatric and adolescent; Strangulation

**1. Introduction**

WHO<sup>1</sup> defines the pediatric age group as from birth to 12 years of age and adolescent age from 12 to 19 years. There was a substantial fall in the unintentional death rate, but no reduction in the intentional death rate among children and teenagers between 1980 and 1995.<sup>2</sup> The incidence of pediatric and adolescent violent deaths is increasing. During 1995–1999, in Delhi 5.97% medico-legal autopsies were conducted on the victims aged up to 12 years.<sup>3</sup> Similar figures for teenagers (10–19 yr) constituted 7.77% during the period 1994–2003.<sup>4</sup> According to Sabo et al.,<sup>5</sup> 7.4% of deaths caused by strangulation in Peoria County involved children under 18 yr of age. The incidence of pediatric and adolescent deaths due to strangulation in India amongst all cases of strangulation is 22.4%.<sup>6</sup> The incidence of pediatric strangulation in Delhi itself is reported as 4.26% of all unnatural deaths.

The majority of the studies on strangulation cover all age groups of victims, even though pediatric and adoles-

cent strangulation forms a significant sub group. This group may have its own particular characteristics. The present study examined a cohort of 28 cases of fatal pediatric and adolescent strangulation.

**2. Materials and methods**

The study was conducted at the department of Forensic Medicine and Toxicology, University College of Medical Sciences, Delhi, India. The data for the study were obtained from the departmental records for the period from 1993 to 2004 (12 years). In India, according to Juvenile Justice Act, 2000<sup>7</sup> any person under the age of 18 yr is taken as a child. Therefore, all cases with cause of death strangulation up to the age of 18 yr were selected for detailed analysis. This department is solely responsible for conducting postmortems on all suspicious deaths occurring in the district of Northeast Delhi (one of the nine such districts in capital territory of Delhi with a population of ~1.5 million). The majority of the population of this district belongs to low socioeconomic strata with multi religious character.

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### 3. Results

#### 3.1. Age and sex distribution

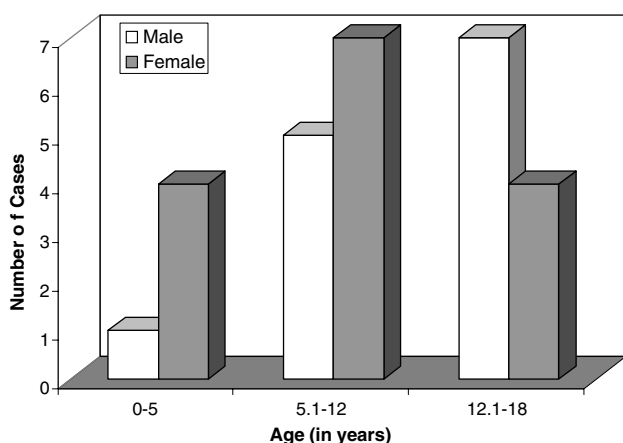
The cases are divided into three age groups: (a) 0–5 yr (pre-school age); (b) 5.1–12 yr (school going age); and (c) 12.1–18 yr (adolescent age). The number of cases in each group has been depicted in [Bar diagram 1](#). The mean age of female victims was 8.4, while among male victims it was 12 and overall mean of 10 yr. Most cases were in school-going and adolescent age group 1 than pre-school. The overall male:female ratio was 3:4, showing a predominance of female victims. Two cases were of newborn infants: one male and one female sex.

#### 3.2. Religion

Religion was known in 22/28 cases. Out of these 16/22, 16 (73%) were Hindu and 6 (27%) were Muslim.

#### 3.3. Method of strangulation

Two types of strangulation were found in the present series – ligature and manual. However, the ligature strangulation was more prevalent with involvement in 22 (78.5%) cases and manual in 6 (21.5%) cases. Both genders were almost equally involved in ligature strangulation. However, a different pattern was observed in manual strangulation where females were twice more than males. [Table 1](#) shows the incidences of both types of strangulation in relation to age and gender.



Bar diagram 1. Age and sex distribution of cases.

Table 1  
Type of strangulation in relation to age and gender (n = 28)

Type of strangulation	Age (in years)						Total	
	0–5		5.1–12		12.1–18		M	F
	M	F	M	F	M	F		
Ligature	1	3	3	7	6	2	10	12
Manual	–	1	1	1	1	2	2	4

#### 3.4. Mode of strangulation

A large majority of 26 (93%) cases were homicidal in nature, whereas only 2 (7%) cases were accidental in nature. No case of suicidal strangulation was found in the series.

#### 3.5. Ligature material

Ligature material was present in 12 (55%) cases out of 22 cases of ligature strangulation. Clothing and other possessions were the commonest ligature materials used in 7 (58%) cases, followed by rope in 4 (33%) cases and even umbilical cord was used in one case as ligating material to produce strangulation.

#### 3.6. Fracture of osseo-cartilaginous structure

The prevalence of fracture of bony and cartilaginous structures of neck was found to be 25% in this study on dissection and gross macroscopic examination. Of these 7 cases of fractures, thyroid horns were fractured in 5 (71.4%) cases and the hyoid was found involved in 2 (28.6%) cases. No case with simultaneous involvement of both structures was found in the study.

#### 3.7. Associated injuries

Other associated injuries apart from neck were found in 15 (53.5%) cases. Age and gender wise distribution of associated injuries is given in [Table 2](#).

#### 3.8. Reasons for strangulation

Of 28 cases, the reason for strangulation was evident only in 11 (39.3%) cases. Of these 11 cases, the commonest reason was kidnapping in 5 (45.5%), 2 cases each were accidental and due to social reason (feticide), one case each was due to sex related and dacoity (detail in [Table 3](#)).

Table 2  
Age and gender distribution of associated injuries in strangulation (n = 15)

Age (in years)	Gender	
	M	F
0–5	1	2
5.1–12	3	4
12.1–18	3	2

Table 3  
Reasons for strangulation

Reason	No. of cases (percentage)
Kidnapping	5 (17.8)
Social	2 (7.1)
Accidental	2 (7.1)
Sex related	1 (3.6)
Dacoity	1 (3.6)
Not known	17 (60.7)
Total	28 (100)

#### 4. Discussion

Unlawful killings of children has always evoked emotion and attracted extensive media coverage, yet the subject has received little systematic study.<sup>8</sup> Children account for 10–20% of all homicide victims in US, UK, Canada and Australia.<sup>9</sup> Hougen et al.<sup>10</sup> reported pediatric and adolescent homicide rate in Copenhagen during 1985–1994 as 13.8%. In Delhi, 13.9% (during 1982–1986) and 22.8% (during 1992–1996) deaths due to homicides were in the age group under 20 years of age.<sup>11</sup> Among these homicidal deaths, strangulation alone accounts for 4–10% cases in different parts of the country.<sup>1,3,11</sup> The involvement of pediatric and adolescent victims amongst all cases of strangulation in the present was 22.4%. These figures are in tune with other similar study from South Delhi, that shows a percentage of 26.3% (the figure is up to 20 years of age).<sup>12</sup>

The male, female ratio in the present study was 3:4. Higher involvement of female victims in childhood was also reported by Lockemann et al.<sup>13</sup> The female dominance was much more in pre-school age victims, where the ratio was 4:1 in favor of female children. The majority of studies on the victims of strangulation shows an overall higher involvement of males with male, female ratio varying from 3:2<sup>5,10</sup> to 13:1.<sup>14</sup>

Regarding age, the victims in the pediatric age, i.e., up to 12 years, were more ( $n = 17$ ) than the adolescent age group ( $n = 11$ ). The possible explanation for such finding could be:

- (a) The pediatric age group is bigger in comparison to adolescent group; and
- (b) It is easier to strangle lesser age children than the adolescent ones.

There was hardly any difference as far as the involvements of victims of different religions are concerned. The victims involved were in consonance with the population ratio of two religions in the country.

Ligature strangulation was more than three times higher (78.5%) than manual strangulation (21.5%). These figures almost coincide with the overall trend of strangulation death.<sup>6</sup> No comparable data on pediatric strangulation could be traced in the literature on this aspect by the authors.

The ligature material mostly used in the present series was clothing and possessions of the victim, such as *dupp-attalchunnilshirt/sari*. A similar finding was observed by Sharma et al.<sup>15</sup> The reason for such finding appears obvious as these items are easily available at the scene of crime and the perpetrator need not have to prepare beforehand. Ropes and strings were other ligature materials used.

Deaths due to strangulation are usually homicidal in nature, though cases of accidental and suicidal nature are also described in the literature.<sup>16,17</sup> In the present study, a little more than 92% of the cases were homicidal and two cases were accidental in nature (one due to entrapment of clothing's in the moving cycle rickshaw

and other due to encircling of umbilical cord in a new born). However, Lockemann et al.<sup>13</sup> describes a lower rate of homicidal strangulation with figures at 60%, and higher accidental strangulation with figures at 23.3% and suicidal strangulation with figures at 13.3% amongst children up to 14 years of age. No case of suicide by strangulation was seen in the present series. Data on suicide in our country also suggest that strangulation, as a method of committing suicide, is very rare in this part of the world in any age.<sup>18</sup>

Fracture of thyroid cartilage/hyoid bone/cricoid or combination of them is usually associated with neck compressions. The presence of fractures in these cases depends upon multiple factors including age. A higher prevalence of fractures is linearly correlated with higher age due to the ossification of these structures and thereby losing elasticity. In the present series, 5 (17.8%) cases showed fracture of thyroid horn at the junction of the body. Hyoid was found fractured in 2 (7.1%) cases. In no case, simultaneous fracture of both structures was found. No comparable data were found on this issue. However, the series shows a fairly good prevalence of osseo-cartilaginous fractures in the neck to the tune of 25%, considering the age of victims.

Associated injuries were found in 53.5% cases. The injuries were mainly blunt force injuries in the form of abrasions and bruises, observed in 93.3% victims. Lacerations were also found in 20% cases along with abrasions and bruises. The commonest site of injury was head (in 73.3%) followed by extremities (in 46.6%), chest and abdomen (in 33.3%) and genitals (in 13.3%) cases. Teeth bite marks over lips were observed in one case. The injuries were defensive in nature. The prevalence of injuries was in consonance with the overall trend.<sup>6</sup>

In a large number of cases, the exact reason for strangulation was not known (60.7%) at the time of post-mortem or shortly after that. Among the cases where the reason for strangulation was known (39.3%), kidnapping was the major reason in 45.5% of the cases. In India, kidnapping is an industry for extorting money and children are the soft targets. When the demands of the kidnappers are not met by the parents/relatives, killing is an easy way to remove the key eye witness, i.e., the kidnapped child. Two cases of infanticide were also encountered in the present cohort. Killing of female infants for social reasons is another big issue in India leading to a skewed ratio. Sex related deaths were low (5.9%) among the cases with known reasons in the present study in comparison to studies from the west with an incidence of 66.7% in the UK.<sup>19</sup>

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